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Date 6 18 0 Label No. 7 0 6 7 4 3 3 4

I hereby certify that, on the date indicated above, this paper or fee was deposited with the U.S. Postal Service & that it was addressed for delivery to the Assistant Commissioner for Patents, Washington, DC 20231 by "Express Mail Post Office to Addressee" service.

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B.W.LFE Name (Print) B.W. Lee

Customer No.:

07278

PATENT TRADEMARK OFFICE

Docket No.: 9373/1G811US1

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Frances H. ARNOLD, et al.

Serial No.: 09/722,602 Art Unit: TBA

Confirmation No.: 5781

Filed: November 27, 2000 Examiner: TBA

For: DIRECTED EVOLUTION OF OXIDASE ENZYMES

\_\_\_\_\_

## **STATEMENT PURSUANT TO RULE 1.821(f)**

June 18, 2001

Hon. Commissioner for Patents and Trademarks Washington, DC 20231

Sir:

Enclosed herewith is a computer readable form (diskette) and a paper copy containing a sequence listing for the above-referenced matter.

The contents of the attached paper entitled "SEQUENCE LISTING" and of the accompanying identically labeled diskette, specifically the ASCII-encoded file therein labeled "Seqlist.txt", are identical.

This sequence submission contains no new matter.

Consideration of the enclosed diskette and paper are respectfully requested.

Respectfully submitted,

Paul F. Fehlner, Ph.D.

Reg. No. 31,135

Agent for Applicants

DARBY & DARBY, P.C. 805 Third Avenue New York, N.Y. 10022 Phone (212) 527-7700



## SEQUENCE LISTING

<110> ARNOLD, Frances H. PETROUNIA, Ionna P. SUN, Lianhong

<120> DIRECTED EVOLUTION OF OXIDASE ENZYMES

<130> 9373/1G811US1

<140> US 09/722,602

<141> 2000-11-27

<150> US 09/571,553

<151> 2000-05-16

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	130	Glu				135	Pro				14U			Ile	
145	Phe				150	Tyr				155				Gly	100
Trp				165	Asp				170					Ala 175	
			180	Gly				185					190	Asn	
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Pro	210					215					220			Lys	
Asp 225	Met				230					235				Ile	240
Val				245					250					Ser 255	
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305					310					315				Pro	320
Leu				325					330					Ala 335	
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	370					375					380				Gly
385					390					395					Gly 400
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			420	)				425	F				430	l	Ser
		435	)				44C	)				445	ı		Pro
Asp	Gly	y Ser	Thr	Phe	e Ile	Thr	Gly	g Gly	Gln	Arg	Arg	r Gly	, Ile	Pro	Phe

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                                585
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Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn
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Val Asn Gly Leu Ser Met Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly
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Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp
                                    90
                85
Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys
            100
                                105
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Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala
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Ile Thr Glu Ala Asn Gly Gln Pro Trp Thr Ser Ile Ala Glu Ile Asn
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                                        155
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Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp
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                                185
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Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Val Thr Lys His
                        215
                                            220
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                    230
                                        235
Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser
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                                265
Gln Ser Ser Ala Thr Met Ser Asp Gly Arg Val Phe Thr Ile Gly Gly
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Ser Trp Ser Gly Gly Val Phe Glu Lys Asn Gly Glu Val Tyr Ser Pro
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                                            300
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                                    330
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Gly Ser Pro Asp Tyr Gln Asp Ser Asp Ala Thr Thr Asn Ala His Ile
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Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
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Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
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Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Ala Tyr His
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                                    490
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Gly Leu Ser Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
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Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
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Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
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<213> Dactylium dendroides

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Gln	Ser	Ser 275	Ala	Thr	Met	Ser	Asp 280	Gly	Arg	Val	Phe	Thr 285	Ile	Gly	Gly
Ser	Trp 290	Ser	Gly	Gly	Val	Phe 295		Lys	Asn	Gly	Glu 300	Val	Tyr	Ser	Pro
Ser 305	Ser	Lys	Thr	Trp	Thr 310		Leu	Pro	Asn	Ala 315	Lys	Val	Asn	Pro	Met 320
Leu	Thr	Ala	Asp	Lys 325			Leu	Tyr	Arg 330	Ser	Asp	Asn	His	Ala 335	Trp
Leu	Phe	Gly	Trp 340	Lys	Lys	Gly	Ser	Val 345		Gln	Ala	Gly	Pro 350	Ser	Thr
Ala	Met	Asn 355	Trp	Tyr	Tyr	Thr	Ser 360		Ser	Gly	Asp	Val 365	Lys	Ser	Ala
Gly	Lys 370	Arg	Gln	Ser	Asn	Arg 375		Val	Ala	Pro	Asp 380	Ala	Met	Суѕ	Gly
Asn 385		Val	Met	Tyr	Asp 390	Ala	Val	Lys	Gly	Lys 395	Ile	Leu	Thr	Phe	Gly 400
Gly	Ser	Pro	Asp	Tyr 405		Asp	Ser	Asp	Ala 410	Thr	Thr	Asn	Ala	His 415	Ile
Ile	Thr	Leu	Gly 420		Pro	Gly	Thr	Ser 425	Pro	Asn	Thr	Val	Phe 430	Ala	Ser
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	450	Ser				455					460				Phe
465					470					475					Gln 480
Asp	Thr	Phe			Gln	Asn	Pro	Asn	Ser 490	Ile	Val	Arg	Ala	Tyr 495	His
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		515					520					525			Phe
	530					535					540				Pro
545					550					555					Ile 560
Thr	Ile			565					570					575	
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Thr	Leu	Thr	Asn	Asn	Gly	Gly	Asn	Ser	Tyr	Ser	Phe	Gln	Val	Pro	Ser

275

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Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn
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Val Asn Gly Leu Ser Met Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly
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Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala
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Val Phe Gln Ala Ser Ser Tyr Thr Ala Pro Gln Pro Gly Leu Gly Arg
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Trp Gly Pro Thr Ile Asp Leu Pro Ile Val Pro Ala Ala Ala Ile
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                                    170
Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp
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Ala Phe Gly Gly Ser Pro Gly Gly Ile Thr Leu Thr Ser Ser Trp Asp
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                                                 205
Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Val Thr Lys His
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                                            220
Asp Met Phe Cys Pro Gly Ile Ser Met Asp Gly Asn Gly Gln Ile Val
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Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser
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Leu Phe Gly Trp Lys Lys Gly Ser Val Phe Gln Ala Gly Pro Ser Thr
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Ala Met Asn Trp Tyr Tyr Thr Ser Gly Ser Gly Asp Val Lys Ser Ala
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                                585
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
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Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser
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Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
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40

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Tyr	Ser	Asn 115	Phe	Glu	Thr	Arg	Pro 120	Ala	Arg	Tyr	Val	Arg 125	Leu	Val	Ala
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Val 145	Phe	Gln	Ala	Ser	Ser 150	Tyr	Thr	Ala	Pro	Gln 155	Pro	Gly	Leu	Gly	Arg 160
Trp	Gly	Pro	Thr	Ile 165	Asp	Leu	Pro	Ile	Val 170	Pro	Ala	Ala	Ala	Ala 175	Ile
Glu	Pro	Thr	Ser 180	Gly	Arg	Val	Leu	Met 185	Trp	Ser	Ser	Tyr	Arg 190	Asn	Asp
Ala	Phe	Gly 195	Gly	Ser	Pro	Gly	Gly 200	Ile	Thr	Leu	Thr	Ser 205	Ser	Trp	Asp
Pro	Ser 210	Thr	Gly	Ile	Val	Ser 215	Asp	Arg	Thr	Val	Thr 220	Val	Thr	Lys	His
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Val	Thr	Gly	Gly	Asn 245	Asp	Ala	Lys	Lys	Thr 250	Ser	Leu	Tyr	Asp	Ser 255	Ser
Ser	Asp	Ser	Trp 260	Ile	Pro	Gly	Pro	Asp 265	Met	Gln	Val	Ala	Arg 270	Gly	Tyr
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		275	Ala				280	Gly							
Ser	Trp 290	275 Ser	Ala Gly	Gly	Val	Phe 295	280 Glu	Gly Lys	Asn	Gly	Glu 300	285	Tyr	Ser	Pro
Ser Ser 305	Trp 290 Ser	275 Ser Lys	Ala Gly Thr	Gly Trp	Val Thr 310	Phe 295 Ser	280 Glu Leu	Gly Lys Pro	Asn Asn	Gly Ala 315	Glu 300 Lys	285 Val	Tyr Asn	Ser Pro	Pro Met 320
Ser Ser 305 Leu	Trp 290 Ser Thr	275 Ser Lys Ala	Ala Gly Thr Asp	Gly Trp Lys 325	Val Thr 310 Gln	Phe 295 Ser Gly	280 Glu Leu Leu	Gly Lys Pro Tyr	Asn Asn Arg 330	Gly Ala 315 Ser	Glu 300 Lys Asp	285 Val Val	Tyr Asn His	Ser Pro Ala 335	Pro Met 320 Trp
Ser Ser 305 Leu Leu	Trp 290 Ser Thr	275 Ser Lys Ala Gly	Ala Gly Thr Asp Trp 340	Gly Trp Lys 325 Lys	Val Thr 310 Gln Lys	Phe 295 Ser Gly	280 Glu Leu Leu Ser	Gly Lys Pro Tyr Val 345	Asn Asn Arg 330 Phe	Gly Ala 315 Ser Gln	Glu 300 Lys Asp	285 Val Val Asn	Tyr Asn His Pro 350	Ser Pro Ala 335 Ser	Pro Met 320 Trp Thr
Ser Ser 305 Leu Leu Ala	Trp 290 Ser Thr Phe Met	275 Ser Lys Ala Gly Asn 355	Ala Gly Thr Asp Trp 340 Trp	Gly Trp Lys 325 Lys	Val Thr 310 Gln Lys Tyr	Phe 295 Ser Gly Gly Thr	280 Glu Leu Leu Ser Ser 360	Gly Lys Pro Tyr Val 345 Gly	Asn Asn Arg 330 Phe Ser	Gly Ala 315 Ser Gln Gly	Glu 300 Lys Asp Ala Asp	285 Val Val Asn Gly Val	Tyr Asn His Pro 350 Lys	Ser Pro Ala 335 Ser Ser	Pro Met 320 Trp Thr
Ser Ser 305 Leu Leu Ala Gly	Trp 290 Ser Thr Phe Met Lys 370	275 Ser Lys Ala Gly Asn 355 Arg	Ala Gly Thr Asp Trp 340 Trp Gln	Gly Trp Lys 325 Lys Tyr Ser	Val Thr 310 Gln Lys Tyr Asn	Phe 295 Ser Gly Gly Thr Arg 375	280 Glu Leu Leu Ser Ser 360 Gly	Gly Lys Pro Tyr Val 345 Gly Val	Asn Arg 330 Phe Ser Ala	Gly Ala 315 Ser Gln Gly Pro	Glu 300 Lys Asp Ala Asp Asp 380	285 Val Val Asn Gly Val 365	Tyr Asn His Pro 350 Lys Met	Ser Pro Ala 335 Ser Ser	Pro Met 320 Trp Thr Ala Gly
Ser Ser 305 Leu Leu Ala Gly Asn 385 Gly	Trp 290 Ser Thr Phe Met Lys 370 Ala Ser	275 Ser Lys Ala Gly Asn 355 Arg Val Pro	Ala Gly Thr Asp Trp 340 Trp Gln Met Asp	Gly Trp Lys 325 Lys Tyr Ser Tyr Tyr 405	Val Thr 310 Gln Lys Tyr Asn Asp 390 Gln	Phe 295 Ser Gly Gly Thr Arg 375 Ala Asp	280 Glu Leu Leu Ser 360 Gly Val Ser	Gly Lys Pro Tyr Val 345 Gly Val Lys Asp	Asn Arg 330 Phe Ser Ala Gly Ala 410	Gly Ala 315 Ser Gln Gly Pro Lys 395 Thr	Glu 300 Lys Asp Ala Asp Asp 380 Ile	285 Val Val Asn Gly Val 365 Ala	Tyr Asn His Pro 350 Lys Met Thr Ala	Ser Pro Ala 335 Ser Ser Cys Phe His 415	Pro Met 320 Trp Thr Ala Gly Gly 400 Ile

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Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
                            440
Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe
                                             460
                        455
Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
                                        475
                    470
Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Ala Tyr His
                                    490
                485
Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly
                                505
            500
Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
                                                 525
                            520
        515
Thr Pro Asn Tyr Leu Tyr Asp Ser Asn Gly Asn Leu Ala Thr Arg Pro
                                             540
                        535
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
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Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
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Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
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            580
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
                             600
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
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Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
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Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp
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Gly Asn Lys Asp Thr Phe Trp His Thr Phe Tyr Gly Ala Asn Gly Asp
                                                 45
                             40
Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn
                         55
Val Asn Gly Leu Ser Val Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly
                     70
Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp
                                     90
                 85
 Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys
                                 105
 Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala
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		115					120					125			
Ile	Thr 130	Glu	Ala	Asn	Gly	Gln 135	Pro	Trp	Thr	Ser	Ile 140	Ala	Glu	Ile	Asn
Val 145	Phe	Gln	Ala	Ser	Ser 150	Tyr	Thr	Ala	Pro	Gln 155	Pro	Gly	Leu	Gly	Arg 160
Trp	Gly	Pro	Thr	Ile 165	Asp	Leu	Pro	Ile	Val 170	Pro	Ala	Ala	Ala	Ala 175	Ile
Glu	Pro	Thr	Ser 180	Gly	Arg	Val	Leu	Met 185	Trp	Ser	Ser	Tyr	Arg 190	Asn	Asp
Ala	Phe	Gly 195	Gly	Ser	Pro	Gly	Gly 200	Ile	Thr	Leu	Thr	Ser 205	Ser	Trp	Asp
Pro	Ser 210	Thr	Gly	Ile	Val	Ser 215	Asp	Arg	Thr	Val	Thr 220	Val	Thr	Lys	His
Asp 225	Met	Phe	Cys	Pro	Gly 230	Ile	Ser	Met	Asp	Gly 235	Asn	Gly	Gln	Ile	Val 240
Val	Thr	Gly	Gly	Asn 245	Asp	Ala	Lys	Lys	Thr 250	Ser	Leu	Tyr	Asp	Ser 255	Ser
Ser	Asp	Ser	Trp 260	Ile	Pro	Gly	Pro	Asp 265	Met	Gln	Val	Ala	Arg 270	Gly	Tyr
Gln	Ser	Ser 275	Ala	Thr	Met	Ser	Asp 280	Gly	Arg	Val	Phe	Thr 285	Ile	Gly	Gly
Ser	Trp 290	Ser	Gly	Gly	Val	Phe 295	Glu	Lys	Asn	Gly	Glu 300	Val	Tyr	Ser	Pro
Ser 305	Ser	Lys	Thr	Trp	Thr 310	Ser	Leu	Pro	Asn	Ala 315	Lys	Val	Asn	Pro	Met 320
Leu	Thr	Ala	Asp	Lys 325	Gln	Gly	Leu	Tyr	Arg 330	Ser	Asp	Asn	His	Ala 335	Trp
		_	Trp 340	_	-	_		345				_	350		
		355	Trp				360					365			
-	370	_				375	_				380			_	Gly
385					390					395					Gly 400
				405					410					415	Ile
			Gly 420			_		425					430		
	_	435	Tyr			_	440					445			
	450		Thr			455	_	_		_	460	_			
465					470					475	_				Gln 480
_			Tyr	485					490			_		495	
Ser	Ile	Ser	Leu	Leu	Leu	Pro	Asp	Gly	Arg	Val	Phe	Asn	Gly	Gly	Gly

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500
                                505
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Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
                            520
                                                 525
Thr Pro Asn Tyr Leu Tyr Asn Ser Asn Gly Asn Leu Ala Thr Arg Pro
                        535
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
                    550
                                        555
Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
                565
                                    570
Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
                                585
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
        595
                            600
                                                 605
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
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Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
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<210> 17

<211> 639

<212> PRT

<213> Dactylium dendroides

<400> 17

Ala Ser Ala Pro Ile Gly Ser Ala Ile Pro Arg Asn Asn Trp Ala Val Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp 25 Gly Asn Lys Asp Thr Phe Trp His Thr Phe Tyr Gly Ala Asn Gly Asp 40 Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn Val Asn Gly Leu Ser Val Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp 90 85 Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys 105 Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala 120 125 115 Ile Thr Glu Ala Asn Gly Gln Pro Trp Thr Ser Ile Ala Glu Ile Asn 135 Val Phe Gln Ala Ser Ser Tyr Thr Ala Pro Gln Pro Gly Leu Gly Arg 150 155 Trp Gly Pro Thr Ile Asp Leu Pro Ile Val Pro Ala Ala Ala Ile 165 170 Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp 180 185

Ala Phe Glu Gly Ser Pro Gly Gly Ile Thr Leu Thr Ser Ser Trp Asp Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Lys His Asp Met Phe Cys Pro Gly Ile Ser Met Asp Gly Asn Gly Gln Ile Val Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser Ser Asp Ser Trp Ile Pro Gly Pro Asp Met Gln Val Ala Arg Gly Tyr Gln Ser Ser Ala Thr Met Ser Asp Gly Arg Val Phe Thr Ile Gly Gly Ser Trp Ser Gly Gly Val Phe Glu Lys Asn Gly Glu Val Tyr Ser Pro Ser Ser Lys Thr Trp Thr Ser Leu Pro Asn Ala Lys Val Asn Pro Met Leu Thr Ala Asp Lys Gln Gly Leu Tyr Arg Ser Asp Asn His Ala Trp Leu Phe Gly Trp Lys Lys Gly Ser Val Phe Gln Ala Gly Pro Ser Thr Ala Met Asn Trp Tyr Tyr Thr Ser Gly Ser Gly Asp Val Lys Ser Ala Gly Lys Arg Gln Ser Asn Arg Gly Val Ala Pro Asp Ala Met Cys Gly Asn Ala Val Met Tyr Asp Ala Val Lys Gly Lys Ile Leu Thr Phe Gly Gly Ser Pro Asp Tyr Gln Asp Ser Asp Ala Thr Thr Asn Ala His Ile Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Ala Tyr His Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe Thr Pro Asn Tyr Leu Tyr Asp Ser Asn Gly Asn Leu Ala Thr Arg Pro Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr 

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Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
            580
                                585
                                                     590
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
                            600
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
                        615
                                            620
Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
                    630
                                        635
      <210> 18
      <211> 639
      <212> PRT
      <213> Dactylium dendroides
      <400> 18
Ala Ser Ala Pro Ile Gly Ser Ala Ile Ser Arg Asn Asn Trp Ala Val
Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp
                                25
Gly Asn Lys Asp Thr Phe Trp His Thr Phe Tyr Gly Ala Asn Gly Asp
                            40
Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn
                        55
Val Asn Gly Leu Ser Met Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly
                    70
Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp
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Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys 105 110 Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala 115 120 125 Ile Thr Glu Ala Asn Gly Gln Pro Trp Thr Ser Ile Ala Glu Ile Asn 135 Val Phe Gln Ala Ser Ser Tyr Thr Ala Pro Gln Pro Gly Leu Gly Arg 150 155 Trp Gly Pro Thr Ile Asp Leu Pro Ile Val Pro Ala Ala Ala Ile 170 165 Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp 180 185 Ala Phe Gly Gly Ser Pro Gly Gly Ile Thr Leu Thr Ser Ser Trp Asp 200 205 Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Val Thr Lys His 215 Asp Met Phe Cys Pro Gly Ile Ser Met Asp Gly Asn Gly Gln Ile Val 230 235 Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser 250 245 Ser Asp Ser Trp Ile Pro Gly Pro Asp Met Gln Val Ala Arg Gly Tyr

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260
                                265
Gln Ser Ser Ala Thr Met Ser Asp Gly Arg Val Phe Thr Ile Gly Gly
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                                                285
        275
Ser Trp Ser Gly Gly Val Phe Glu Lys Asn Gly Glu Val Tyr Ser Pro
                        295
                                            300
Ser Ser Lys Thr Trp Thr Ser Leu Pro Asn Ala Lys Val Asn Pro Met
                    310
                                        315
Leu Thr Ala Asp Lys Gln Gly Leu Tyr Arg Ser Asp Asn His Ala Trp
                                    330
                325
Leu Phe Gly Trp Lys Lys Gly Ser Val Phe Gln Ala Gly Pro Ser Thr
                                345
            340
Ala Met Asn Trp Tyr Tyr Thr Ser Gly Ser Gly Asp Val Lys Ser Ala
                            360
                                                365
Gly Lys Arg Gln Ser Asn Arg Gly Val Ala Pro Asp Ala Met Cys Gly
                        375
Asn Ala Val Met Tyr Asp Ala Val Lys Gly Lys Ile Leu Thr Phe Gly
                                        395
                    390
Gly Ser Pro Asp Tyr Gln Asp Ser Asp Ala Thr Thr Asp Ala His Ile
                405
                                    410
Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser
            420
                                425
Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
                            440
Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe
                        455
                                            460
Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
                    470
                                        475
Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Val Tyr His
                                    490
                485
Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly Gly
                                505
Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
                            520
                                                 525
        515
Thr Pro Asn Tyr Leu Tyr Asn Ser Asn Gly Asn Leu Ala Thr Arg Pro
                        535
                                            540
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
                                        555
                    550
Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
                                    570
                565
Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
                                585
            580
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
                            600
                                                 605
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
                        615
                                            620
Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
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625
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<210> 19
<211> 639
<212> PRT
<213> Dactylium dendroides
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<400> 19 Ala Ser Ala Pro Ile Gly Ser Ala Ile Ser Arg Asn Asn Trp Ala Val 10 Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp 20 25 Gly Asn Lys Asp Thr Phe Trp His Thr Phe Tyr Gly Ala Asn Gly Asp 40 Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn 55 Val Asn Gly Leu Ser Met Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp 90 85 Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys 105 Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala 115 120 Ile Thr Glu Ala Asn Gly Gln Pro Trp Thr Ser Ile Ala Glu Ile Asn 135 140 Val Phe Gln Ala Ser Ser Tyr Thr Ala Pro Gln Pro Gly Leu Gly Arg 150 155 160 Trp Gly Pro Thr Ile Asp Leu Pro Ile Val Pro Ala Ala Ala Ile 165 170 Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp 185 Ala Phe Gly Gly Ser Pro Gly Gly Ile Thr Leu Thr Ser Ser Trp Asp 195 200 Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Val Thr Lys His 215 220 Asp Met Phe Cys Pro Gly Ile Ser Met Asp Gly Asn Gly Gln Ile Val 230 235 Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser 245 250 255 Ser Asp Ser Trp Ile Pro Gly Pro Asp Met Gln Val Ala Arg Gly Tyr 265 Gln Ser Ser Ala Thr Met Ser Asp Gly Arg Val Phe Thr Ile Gly Gly 280 Ser Trp Ser Gly Gly Val Phe Glu Lys Asn Gly Glu Val Tyr Ser Pro 295 300 Ser Ser Lys Thr Trp Thr Ser Leu Pro Asn Ala Lys Val Asn Pro Met 310 315 Leu Thr Ala Asp Lys Gln Gly Leu Tyr Arg Ser Asp Asn His Ala Trp

330

335

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Leu Phe Gly Trp Lys Lys Gly Ser Val Phe Gln Ala Gly Pro Ser Thr
            340
                                 345
                                                     350
Ala Met Asn Trp Tyr Tyr Thr Ser Gly Ser Gly Asp Val Lys Ser Ala
        355
                             360
                                                 365
Gly Lys Arg Gln Ser Asn Arg Gly Val Ala Pro Asp Ala Met Cys Gly
                         375
Asn Ala Val Met Tyr Asp Ala Val Lys Gly Lys Ile Leu Thr Phe Gly
                    390
                                         395
Gly Ser Pro Asp Tyr Gln Asp Ser Asp Ala Thr Thr Asp Ala His Ile
                405
                                     410
Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser
                                 425
            420
                                                     430
Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
        435
                            440
                                                 445
Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe
                        455
                                             460
Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
                    470
                                         475
Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Val Tyr His
                485
                                     490
Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly Gly
            500
                                505
Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
        515
                            520
                                                 525
Thr Pro Asn Tyr Leu Tyr Asn Ser Asn Gly Asn Leu Ala Thr Arg Pro
                        535
                                             540
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
                    550
                                         555
Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
                                     570
                565
Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
            580
                                585
                                                     590
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
        595
                            600
                                                 605
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
                        615
                                             620
Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
625
                    630
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<210> 20

<211> 639

<212> PRT

<213> Dactylium dendroides

<400> 20

Ala Ser Ala Pro Ile Gly Ser Ala Ile Ser Arg Asn Asn Trp Ala Val 1 5 10 15 Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp

			20					25					30		
Gly	Asn	Lys 35	Asp	Thr	Phe	Trp	His 40	Thr	Phe	Tyr	Gly	Ala 45	Asn	Gly	Asp
Pro	Lys 50	Pro	Pro	His	Thr	Tyr 55	Thr	Ile	Asp	Met	Lys 60	Thr	Thr	Gln	Asn
Val 65	Asn	Gly	Leu	Ser	Met 70	Leu	Pro	Arg	Gln	Asp 75	Gly	Asn	Gln	Asn	Gly 80
Trp	Ile	Gly	Arg	His 85	Glu	Val	Tyr	Leu	Ser 90	Ser	Asp	Gly	Thr	Asn 95	Trp
Gly	Ser	Pro	Val 100	Ala	Ser	Gly	Ser	Trp 105	Phe	Ala	Asp	Ser	Thr 110	Thr	Lys
Tyr	Ser	Asn 115	Phe	Glu	Thr	Arg	Pro 120	Ala	Arg	Tyr	Val	Arg 125	Leu	Val	Ala
Ile	Thr 130	Glu	Ala	Asn	Gly	Gln 135	Pro	Trp	Thr	Ser	Ile 140	Ala	Glu	Ile	Asn
Val 145	Phe	Gln	Ala	Ser	Ser 150	Tyr	Thr	Ala	Pro	Gln 155	Pro	Gly	Leu	Gly	Arg 160
Trp	Gly	Pro	Thr	Ile 165	Asp	Leu	Pro	Ile	Val 170	Pro	Ala	Ala	Ala	Ala 175	Ile
Glu	Pro	Thr	Ser 180	Gly	Arg	Val	Leu	Met 185	Trp	Ser	Ser	Tyr	Arg 190	Asn	Asp
		195	Gly			-	200					205		-	-
	210		Gly			215	_	_			220			_	
Asp 225	Met	Phe	Cys	Pro	Gly 230	Ile	Ser	Met	Asp	Gly 235	Asn	Gly	Gln	Ile	Val 240
			Gly	245	_		_	_	250			_	_	255	
Ser	Asp	Ser	Trp 260	Ile	Pro	Gly	Pro	Asp 265	Met	Gln	Val	Ala	Arg 270	Gly	Tyr
		275	Ala				280	_	_			285		_	-
Ser	Trp 290	Ser	Gly	Gly	Val	$\circ \circ \vdash$		Lys		_	Glu 300	Val	Tyr	Ser	Pro
Ser 305	Ser	Lys	Thr	Trp	Thr 310	Ser	Leu	Pro	Asn	Ala 315	Lys	Val	Asn	Pro	Met 320
Leu	Thr	Ala	Asp	Lys 325	Gln	Gly	Leu	Tyr	Arg 330	Ser	Asp	Asn	His	Ala 335	Trp
Leu	Phe	Gly	Trp 340	Lys	Lys	Gly	Ser	Val 345	Phe	Gln	Ala	Gly	Pro 350	Ser	Thr
Ala	Met	Asn 355	Trp	Tyr	Tyr	Thr	Ser 360	Gly	Ser	Gly	Asp	Val 365	Lys	Ser	Ala
	370		Gln			375					380				_
Asn 385	Ala	Val	Met	Tyr	Asp 390	Ala	Val	Lys	Gly	Lys 395	Ile	Leu	Thr	Phe	Gly 400
Gly	Ser	Pro	Asp	Tyr	Gln	Asp	Ser	Asp	Ala	Thr	Thr	Asp	Ala	His	Ile

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410
                405
Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser
                                425
            420
Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
                            440
Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe
                        455
Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
                    470
                                        475
Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Ala Tyr His
                                    490
                485
Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly
                                505
                                                     510
Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
                            520
        515
Thr Pro Asn Tyr Leu Tyr Asn Ser Asn Gly Asn Leu Ala Thr Arg Pro
                        535
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
                                        555
                    550
Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
                                    570
                565
Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
                                585
            580
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
                                                 605
                            600
        595
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
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                                             620
Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
                                         635
                    630
      <210> 21
      <211> 639
      <212> PRT
      <213> Dactylium dendroides
      <400> 21
Ala Ser Ala Pro Ile Gly Ser Ala Ile Ser Arg Asn Asn Trp Ala Val
                                     10
Thr Cys Asp Ser Ala Gln Ser Gly Asn Glu Cys Asn Lys Ala Ile Asp
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Gly Asn Lys Asp Thr Phe Trp His Thr Phe Tyr Gly Ala Asn Gly Asp
                             40
Pro Lys Pro Pro His Thr Tyr Thr Ile Asp Met Lys Thr Thr Gln Asn
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Val Asn Gly Leu Ser Met Leu Pro Arg Gln Asp Gly Asn Gln Asn Gly

Trp Ile Gly Arg His Glu Val Tyr Leu Ser Ser Asp Gly Thr Asn Trp

75

90

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Gly Ser Pro Val Ala Ser Gly Ser Trp Phe Ala Asp Ser Thr Thr Lys
             100
                                  105
 Tyr Ser Asn Phe Glu Thr Arg Pro Ala Arg Tyr Val Arg Leu Val Ala
                              120
 Ile Thr Glu Ala Asn Gly Gln Pro Trp Thr Ser Ile Ala Glu Ile Asn
                         135
                                              140
 Val Phe Gln Ala Ser Ser Tyr Thr Ala Pro Gln Pro Gly Leu Gly Arg
                     150
                                          155
 Trp Gly Pro Thr Ile Asp Leu Pro Ile Val Pro Ala Ala Ala Ile
                 165
                                     170
 Glu Pro Thr Ser Gly Arg Val Leu Met Trp Ser Ser Tyr Arg Asn Asp
             180
                                 185
 Ala Phe Gly Gly Ser Pro Gly Gly Ile Thr Leu Thr Ser Ser Trp Asp
         195
                             200
 Pro Ser Thr Gly Ile Val Ser Asp Arg Thr Val Thr Lys His
                         215
Asp Met Phe Cys Pro Gly Ile Ser Met Asp Gly Asn Gly Gln Ile Val
                     230
                                         235
Val Thr Gly Gly Asn Asp Ala Lys Lys Thr Ser Leu Tyr Asp Ser Ser
                 245
                                     250
Ser Asp Ser Trp Ile Pro Gly Pro Asp Met Gln Val Ala Arg Gly Tyr
             260
                                 265
Gln Ser Ser Ala Thr Met Ser Asp Gly Arg Val Phe Thr Ile Gly Gly
                             280
Ser Trp Ser Gly Gly Val Phe Glu Lys Asn Gly Glu Val Tyr Ser Pro
                         295
                                             300
Ser Ser Lys Thr Trp Thr Ser Leu Pro Asn Ala Lys Val Asn Pro Met
                     310
                                         315
Leu Thr Ala Asp Lys Gln Gly Leu Tyr Arg Ser Asp Asn His Ala Trp
                325
                                     330
Leu Phe Gly Trp Lys Lys Gly Ser Val Phe Gln Ala Gly Pro Ser Thr
            340
                                 345
Ala Met Asn Trp Tyr Tyr Thr Ser Gly Ser Gly Asp Val Lys Ser Ala
                            360
                                                 365
Gly Lys Arg Gln Ser Asn Arg Gly Val Ala Pro Asp Ala Met Cys Gly
                        375
                                             380
Asn Ala Val Met Tyr Asp Ala Val Lys Gly Lys Ile Leu Thr Phe Gly
                    390
                                         395
Gly Ser Pro Asp Tyr Gln Asp Ser Asp Ala Thr Thr Asp Ala His Ile
                                    410
Ile Thr Leu Gly Glu Pro Gly Thr Ser Pro Asn Thr Val Phe Ala Ser
            420
                                425
Asn Gly Leu Tyr Phe Ala Arg Thr Phe His Thr Ser Val Val Leu Pro
                            440
                                                 445
Asp Gly Ser Thr Phe Ile Thr Gly Gly Gln Arg Arg Gly Ile Pro Phe
                        455
                                            460
Glu Asp Ser Thr Pro Val Phe Thr Pro Glu Ile Tyr Val Pro Glu Gln
465
                    470
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Asp Thr Phe Tyr Lys Gln Asn Pro Asn Ser Ile Val Arg Ala Tyr His
                 485
                                     490
Ser Ile Ser Leu Leu Pro Asp Gly Arg Val Phe Asn Gly Gly Gly
                                 505
Gly Leu Cys Gly Asp Cys Thr Thr Asn His Phe Asp Ala Gln Ile Phe
        515
                             520
                                                 525
Thr Pro Asn Tyr Leu Tyr Asn Ser Asn Gly Asn Leu Ala Thr Arg Pro
                         535
                                             540
Lys Ile Thr Arg Thr Ser Thr Gln Ser Val Lys Val Gly Gly Arg Ile
                    550
                                         555
                                                              560
Thr Ile Ser Thr Asp Ser Ser Ile Ser Lys Ala Ser Leu Ile Arg Tyr
                565
                                     570
Gly Thr Ala Thr His Thr Val Asn Thr Asp Gln Arg Arg Ile Pro Leu
                                 585
                                                      590
Thr Leu Thr Asn Asn Gly Gly Asn Ser Tyr Ser Phe Gln Val Pro Ser
                             600
                                                 605
Asp Ser Gly Val Ala Leu Pro Gly Tyr Trp Met Leu Phe Val Met Asn
                         615
                                             620
Ser Ala Gly Val Pro Ser Val Ala Ser Thr Ile Arg Val Thr Gln
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Met Ala Ser Ala Pro Ile Gly Ser Ala
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atggcctcag cacctatcgg aagcgcc
    27
      <210> 28
      <211> 27
      <212> DNA
      <213> Dactylium dendroides
      <220>
      <221> unsure
      <222> (1)...(27)
      <223> "n" at positions 6, 9, 12, 15, and 21 is either a,
```

```
t, g, or c.
            "n" at position 18 is either a, t, or c.
      <400> 28
atggcntcng cnccnatngg nagcgcc
      <210> 29
      <211> 14
      <212> DNA
      <213> Artificial Sequence
      <220>
      <223> Vector sequence
      <400> 29
aggaaaagct tatg
    14
      <210> 30
      <211> 15
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      <223> Vector sequence
      <400> 30
aggaaaaagc ttatg
    15
      <210> 31
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      <220>
      <223> Vector sequence
      <400> 31
aggaaacaag cttatg
    16
      <210> 32
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      <212> DNA
      <213> Artificial Sequence
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<220>
      <223> Vector sequence
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aggaacaaag cttatg
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    15
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aggaaacaag cttatg
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16